

Process Specification for the Application of Liquid Locking Compounds

Engineering Directorate

Structural Engineering Division

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Process Specification for the Application of Liquid Locking Compounds

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REVISIONS		
VERSION	CHANGES	DATE
--	Original version	2/27/2012
A	Added drying time for Primer N	3/07/2012

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1.0 SCOPE

This process specification establishes the requirements for the application of liquid locking compound (LLC) to fasteners.

2.0 APPLICABILITY

This specification covers the process requirements for application of liquid locking compounds to ground and non-safety critical flight fasteners.

3.0 USAGE

This process specification shall be called out on the engineering drawing by using a drawing note that identifies the process specification. For example:

APPLY LIQUID LOCKING COMPOUND PER NASA/JSC PRC-XXXX.

This process specification shall not be used for safety-critical fasteners. There is no direct verification that the LLC has cured, and this specification does not include requirements for indirect verification of LLC cure. Please contact your Structures engineer if there is a question

This process specification does not cover the use of LLCs with internal threads in blind holes. Such applications require special techniques, because trapped air pushes the LLC out of the threads as the bolt or screw is inserted.

This process specification does not cover the use of LLC's with helical wire inserts. Insert manufacturer's recommend against it because the cured adhesive doesn't allow the insert to flex. There is also a concern that the insert will back out with the bolt or screw. Locking helical wire inserts are readily available, and inserts that wear out can be easily replaced in the field.

The liquid locking compound (LLC) and primer to be applied shall be called out in the parts list, along with the procurement specification for the LLC.

Primer is essential to the curing of liquid locking compounds. Steel fasteners promote the cure of LLC's, but stainless fasteners do not. Primer has a catalyst that replaces free iron available on steel fasteners. Threads other than stainless steel require prior approval of M&P.

Loctite Primer T is the default primer.

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Loctite 222, 242, and 262 are the most common LLC's used at JSC. The procurement specification for these products is ASTM D5363. These newer products are thixotropic. Since they are less likely to drip or run, they can be applied to the external thread in a measured quantity. The higher the product number, the stronger the adhesive. Generally, the lower numbered products are used on smaller screws so that bolt or screw can be disassembled. Higher strength LLC's are not necessarily better at locking; vibration testing appears to show lower strength ones are about as effective.

Other LLC's and primer products other than these specific Loctite products may be used with this specification. These other products may need different primer dry times, LLC maximum assembly time, or LLC cure times. If different, these process times must be called out on the engineering drawing. Contact M&P before specifying a different LLC's or primers on the engineering drawing.

LLC's also require a lack of oxygen to cure. The close tolerance between the mating threads reduces the oxygen level to a level where the chemical reaction accelerates. Very short thread engagements should be avoided, since the LLC may not cure.

Excess LLC should be avoided. LLC not trapped between the threads will not cure, and can migrate to nearby equipment, where it can cure and lock up a mechanism. The use of a metered application device is recommended, especially when a large quantity of joints are being processed.

Unless specified on the engineering drawing, LLC's will be applied by the technician to the thread engagement area of the external thread only. If the thread engagement zone will be difficult to determine during assembly, or if a different application location is required, the application location shall be specified on the engineering drawing.

The threads to be locked should be free of lubricants, both dry and wet. LLC's shall not be used on plated threads or threads with dry film lubricants without prior approval of M&P.

3.1 WORK INSTRUCTIONS

All work procedures shall be performed to written procedures.

For work performed at JSC facilities, these work procedures shall consist of Detailed Process Instructions (DPI's).

For contracted work, the contractor shall be responsible for preparing, maintaining, and certifying written work procedures to meet the requirements of

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this specification. These procedures shall be provided to NASA/JSC M&P upon request.

4.0 REFERENCES

ASTM D5363 Standard Specification for Anaerobic Single-Component Adhesives

5.0 MATERIAL REQUIREMENTS

None.

6.0 PROCESS REQUIREMENTS

Threads shall be cleaned with solvent before application of LLC and visibly inspected before LLC is applied.

Primer shall be applied to both external and internal threads. The drying time for Primer T and Primer N is one minute minimum. Drying time for other primers shall be called out on the engineering drawing. Primed parts may be stored a maximum of 5 days in sealed plastic bags prior to application of LCC. If not used within 5 days, parts shall be re-cleaned and re-primed.

If LLC is a type that separates, it shall be shaken before use.

LLC shall be applied only to the thread engagement area unless otherwise specified by the engineering drawing. The space between the external and internal threads should be completely filled with the LLC, but excess shall be minimized. Small amounts of squeeze-out are allowed, but shall be removed after assembly. The use of a metered application device is recommended but not required.

Assembly after application of the LLC shall be accomplished within five minutes. The maximum assembly time of LLC's other than Loctite 222, 242, or 262 shall be as called out on the engineering drawing.

After application of LLC, parts shall be subjected to only light handling during the first 6 hours. Moderate use is permitted after 6 hours. Unrestricted use is permitted after 24 hours. The cure time of LLC's other than Loctite 222, 242, or 262, or primers other than Primer T shall as called out on the engineering drawing.

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7.0 PROCESS QUALIFICATION

None required.

8.0 PROCESS VERIFICATION

Assembled joint shall be inspected to assure that excess LLC, liquid or cured, is not visible.

9.0 TRAINING AND CERTIFICATION OF PERSONNEL

All application of liquid locking compounds shall be performed by personnel qualified to conduct the process through training or experience. If these processes are to be performed by an outside vendor, the development of an appropriate training program shall be the responsibility of the vendor.

10.0 DEFINITIONS

none

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